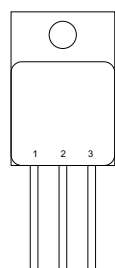
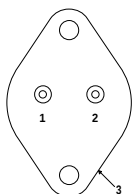


3 AMP POSITIVE ADJUSTABLE VOLTAGE REGULATOR



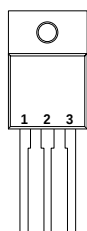
Pin 1 – ADJ.
Pin 2 – V_{OUT}
Case – V_{IN}

Q Package – TO-254



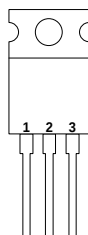
Pin 1 – ADJ.
Pin 2 – V_{IN}
Case – V_{OUT}

K Package – TO-3



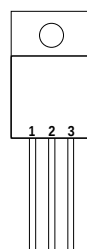
Pin 1 – ADJ.
Pin 2 – V_{OUT}
Pin 3 – V_{IN}
Case – V_{OUT}

V Package – TO-218



Pin 1 – ADJ.
Pin 2 – V_{OUT}
Pin 3 – V_{IN}
Case – V_{OUT}

T Package – TO-220



Pin 1 – ADJ.
Pin 2 – V_{OUT}
Pin 3 – V_{IN}
Case – V_{OUT}^*

G Package – TO-257

IG Package - TO-257

* Isolated case on IG Package

FEATURES

- OUTPUT VOLTAGE RANGE OF 1.25 TO 35V
- 1% OUTPUT VOLTAGE TOLERANCE (–A VERSIONS)
- 0.3% LOAD REGULATION
- 0.01% / V LINE REGULATION
- COMPLETE SERIES OF PROTECTIONS:
 - CURRENT LIMITING
 - THERMAL SHUTDOWN
 - SOA CONTROL

Order Information

Part Number	K-Pack (TO-3)	G/IG-Pack (TO-257)	T-Pack (TO-220)	V-Pack (TO-218)	Q-Pack (TO-254)	Temp. Range	Note: To order, add the package identifier to the part number. eg. IP150AQ
IP150A	✓	✓			✓	-55 to +150°C	
IP150	✓	✓			✓	"	
LM150	✓				✓	-55 to +150°C	
IP350A	✓		✓	✓		0 to 125°C	
IP350	✓		✓	✓		"	

ABSOLUTE MAXIMUM RATINGS ($T_{case} = 25^{\circ}C$ unless otherwise stated)

V_{I-O}	Input - Output Differential Voltage	35V
P_D	Power Dissipation	Internally limited
T_J	Operating Junction Temperature Range	See Table Above
T_{STG}	Storage Temperature	-65 to 150°C
T_L	Lead Temperature (Soldering, 10 sec.)	300°C

Parameter	Test Conditions	IP150A			LM150 IP150			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{REF} Reference Voltage	$I_{OUT} = 10\text{mA}$	1.238	1.25	1.262				V
	$I_{OUT} = 10\text{mA to } 3\text{A}$ $V_{IN} - V_{OUT} = 3\text{V to } 35\text{V}$ $P \leq 30\text{W}$ $T_J = -55 \text{ to } +150^\circ\text{C}$	1.225	1.250	1.270	1.200	1.250	1.300	V
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$ Line Regulation 1	$V_{IN} - V_{OUT} = 3\text{V to } 35\text{V}$ $T_J = -55 \text{ to } +150^\circ\text{C}$		0.005	0.010		0.005	0.010	% / V
			0.020	0.050		0.020	0.050	
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$ Load Regulation 1	$I_{OUT} = 10\text{mA to } 3\text{A}$ $V_{OUT} \leq 5\text{V}$ $T_J = -55 \text{ to } +150^\circ\text{C}$		5	15		5	15	mV
			15	50		20	50	
	$I_{OUT} = 10\text{mA to } 3\text{A}$ $V_{OUT} \geq 5\text{V}$ $T_J = -55 \text{ to } +150^\circ\text{C}$		0.1	0.3		0.1	0.3	%
			0.3	1		0.3	1	
Thermal Regulation	$t_p = 20\text{ms}$ $T_A = 25^\circ\text{C}$		0.002	0.010		0.002	0.010	%/W
Ripple Rejection	$V_{OUT} = 10\text{V}$ $C_{ADJ} = 0$ $f = 120\text{Hz}$		65			65		dB
	$C_{ADJ} = 10\mu\text{F}$ $T_J = -55 \text{ to } +150^\circ\text{C}$	66	86		66	86		dB
I_{ADJ} Adjust Pin Current	$T_J = -55 \text{ to } +150^\circ\text{C}$		50	100		50	100	μA
ΔI_{ADJ} Adjust Pin Current Change	$I_{OUT} = 10\text{mA to } 3\text{A}$ $V_{IN} - V_{OUT} = 3\text{V to } 35\text{V}$ $T_J = -55 \text{ to } +150^\circ\text{C}$		0.2	5		0.2	5	μA
I_{MIN} Minimum Load Current	$V_{IN} - V_{OUT} = 35\text{V}$ $T_J = -55 \text{ to } +150^\circ\text{C}$		3.5	5		3.5	5	mA
I_{CL} Current Limit	$V_{IN} - V_{OUT} \leq 10\text{V}$ $T_J = -55 \text{ to } +150^\circ\text{C}$	3	4.5		3	4.5		A
	$V_{IN} - V_{OUT} = 30\text{V}$	0.3	1		0.3	1		A
$\frac{\Delta V_{OUT}}{\Delta \text{TEMP}}$ Temperature Stability	$T_J = -55 \text{ to } +150^\circ\text{C}$		1	2		1		%
$\frac{\Delta V_{OUT}}{\Delta \text{TIME}}$ Long Term Stability	$T_A = 125^\circ\text{C}$ $t = 1000 \text{ Hrs}$		0.3	1		0.3	1	%
e_n RMS Output Noise (% of V_{OUT})	$f = 10 \text{ Hz to } 10 \text{ kHz}$ $T_A = 25^\circ\text{C}$		0.001			0.001		%
$R_{\theta JC}$ Thermal Resistance Junction to Case	K Package (TO-3)		1.5			1.5		$^\circ\text{C/W}$
	G Package (TO-257)		3	4		3	4	

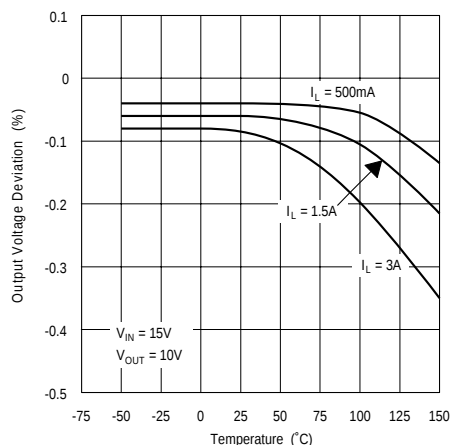
- 1) Regulation is measured at constant junction temperature, using pulse testing at a low duty cycle. Changes in output voltage due to heating effects are covered under thermal regulation specifications. Load regulation is measured from the bottom of the package for the TO-3 package and on the back of the heat tab for the TO-218, TO-220 and TO-257 packages.
- 2) Test Conditions unless otherwise stated: $V_{IN} - V_{OUT} = 5\text{V}$, $T_J = 25^\circ\text{C}$, $I_{OUT} = 1.5\text{A}$.
 Although power dissipation is internally limited, these specifications apply for dissipations of 30W for the TO-3, TO-218 and TO-257 packages, and 25W for the TO-220 package; $I_{MAX} = 3\text{A}$.

Parameter	Test Conditions	IP350A			IP350			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{REF} Reference Voltage	$I_{OUT} = 10\text{mA}$	1.238	1.25	1.262				V
	$I_{OUT} = 10\text{mA to } 3\text{A}$ $V_{IN} - V_{OUT} = 3\text{V to } 35\text{V}$ $P \leq 30\text{W}$ $T_J = 0 \text{ to } +125^\circ\text{C}$	1.225	1.250	1.270	1.200	1.250	1.300	V
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$ Line Regulation 1	$V_{IN} - V_{OUT} = 3\text{V to } 35\text{V}$ $T_J = 0 \text{ to } +125^\circ\text{C}$		0.005	0.010		0.005	0.030	% / V
			0.020	0.050		0.020	0.070	
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$ Load Regulation 1	$I_{OUT} = 10\text{mA to } 3\text{A}$ $V_{OUT} \leq 5\text{V}$ $T_J = 0 \text{ to } +125^\circ\text{C}$		5	15		5	25	mV
			15	50		20	70	
	$I_{OUT} = 10\text{mA to } 3\text{A}$ $V_{OUT} \geq 5\text{V}$ $T_J = 0 \text{ to } +125^\circ\text{C}$		0.1	0.3		0.1	0.5	%
			0.3	1		0.3	1.5	
Thermal Regulation	$t_p = 20\text{ms}$ $T_A = 25^\circ\text{C}$		0.002	0.010		0.002	0.030	%/W
Ripple Rejection	$V_{OUT} = 10\text{V}$ $f = 120\text{Hz}$ $C_{ADJ} = 0$		65			65		dB
	$C_{ADJ} = 10\mu\text{F}$ $T_J = 0 \text{ to } +125^\circ\text{C}$	66	86		66	86		dB
I_{ADJ} Adjust Pin Current	$T_J = 0 \text{ to } +125^\circ\text{C}$		50	100		50	100	μA
ΔI_{ADJ} Adjust Pin Current Change	$I_{OUT} = 10\text{mA to } 3\text{A}$ $V_{IN} - V_{OUT} = 3\text{V to } 35\text{V}$ $T_J = 0 \text{ to } +125^\circ\text{C}$		0.2	5		0.2	5	μA
I_{MIN} Minimum Load Current	$V_{IN} - V_{OUT} = 35\text{V}$ $T_J = 0 \text{ to } +125^\circ\text{C}$		3.5	5		3.5	10	mA
I_{CL} Current Limit	$V_{IN} - V_{OUT} \leq 10\text{V}$ $T_J = 0 \text{ to } +125^\circ\text{C}$	3	4.5		3	4.5		A
	$V_{IN} - V_{OUT} = 30\text{V}$	0.25	1		0.25	1		A
$\frac{\Delta V_{OUT}}{\Delta \text{TEMP}}$ Temperature Stability	$T_J = 0 \text{ to } +125^\circ\text{C}$		1	2		1		%
$\frac{\Delta V_{OUT}}{\Delta \text{TIME}}$ Long Term Stability	$T_A = 125^\circ\text{C}$ $t = 1000 \text{ Hrs}$		0.3	1		0.3	1	%
e_n RMS Output Noise (% of V_{OUT})	$f = 10 \text{ Hz to } 10 \text{ kHz}$ $T_A = 25^\circ\text{C}$		0.001			0.001		%
$R_{\theta JC}$ Thermal Resistance Junction to Case	K Package (TO-3)		1.5			1.5		$^\circ\text{C/W}$
	T Package (TO-220)		3	4		3	4	
	V Package (TO-218)		1.5			1.5		

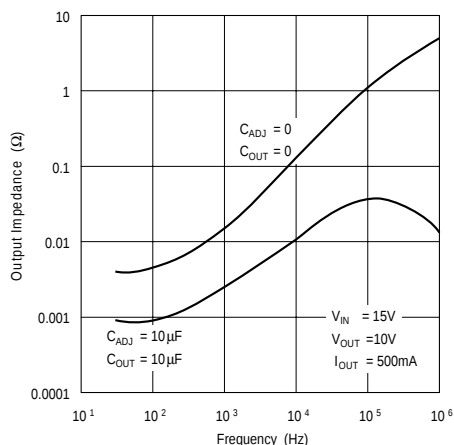
- 1) Regulation is measured at constant junction temperature, using pulse testing at a low duty cycle. Changes in output voltage due to heating effects are covered under thermal regulation specifications. Load regulation is measured from the bottom of the package for the TO-3 package and on the back of the heat tab for the TO-218, TO-220 and TO-257 packages.
- 2) Test Conditions unless otherwise stated: $V_{IN} - V_{OUT} = 5\text{V}$, $T_J = 25^\circ\text{C}$, $I_{OUT} = 1.5\text{A}$.
 Although power dissipation is internally limited, these specifications apply for dissipations of 30W for the TO-3, TO-218 and TO-257 packages, and 25W for the TO-220 package; $I_{MAX} = 3\text{A}$.

TYPICAL PERFORMANCE CHARACTERISTICS

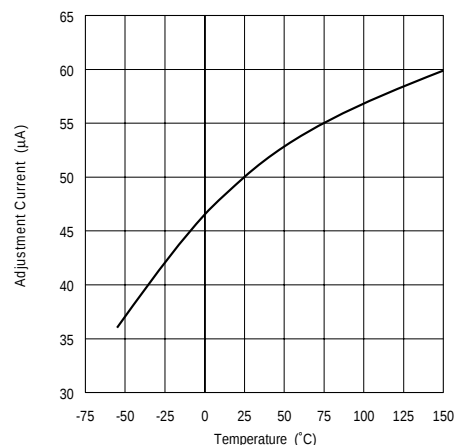
Load Regulation



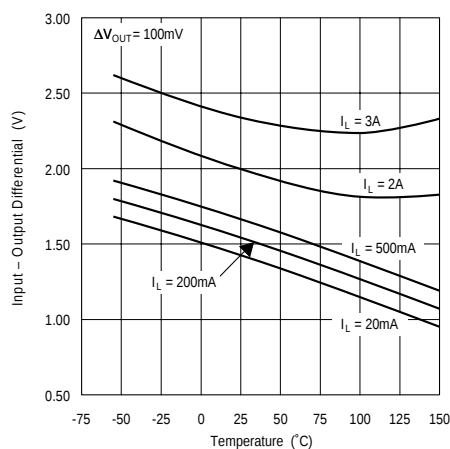
Output Impedance



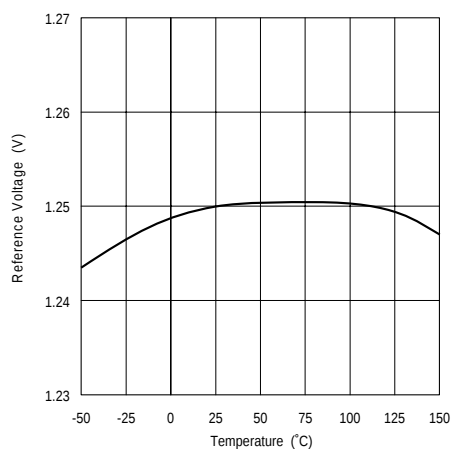
Adjustment Current



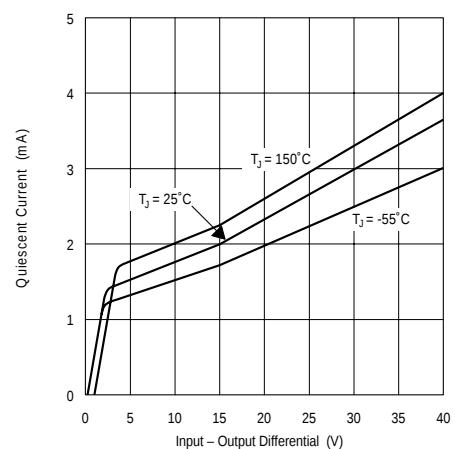
Dropout Voltage



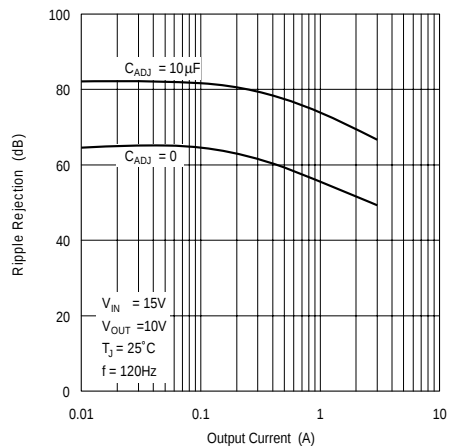
Temperature Stability



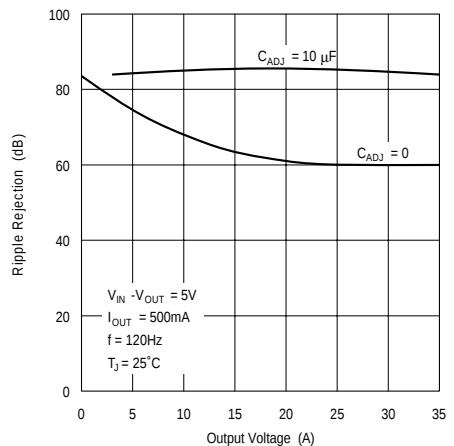
Minimum Operating Current



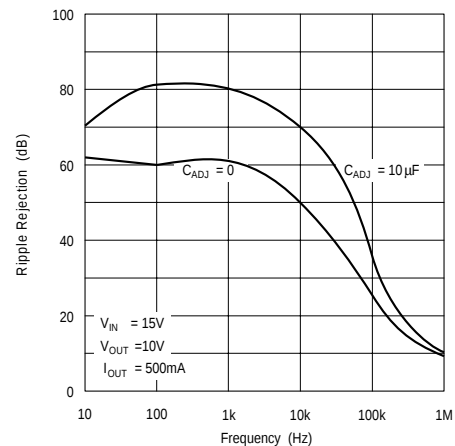
Ripple Rejection



Ripple Rejection

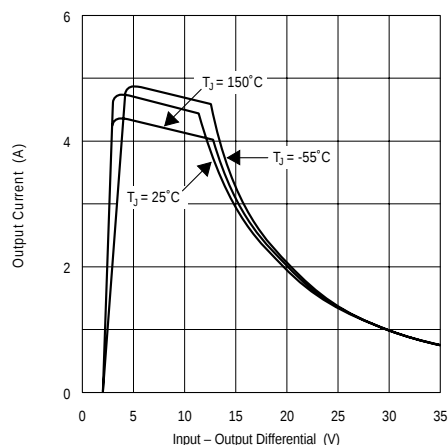


Ripple Rejection

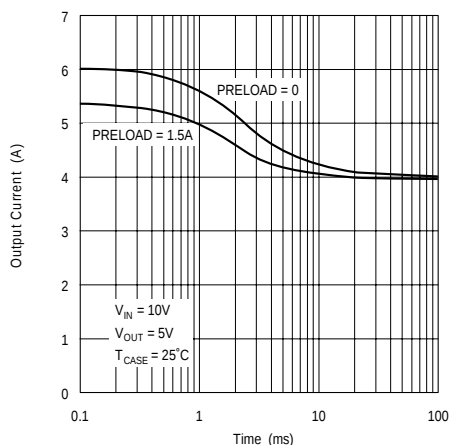


TYPICAL PERFORMANCE CHARACTERISTICS

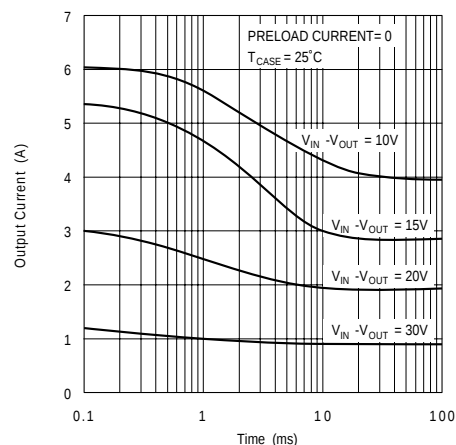
Current Limit



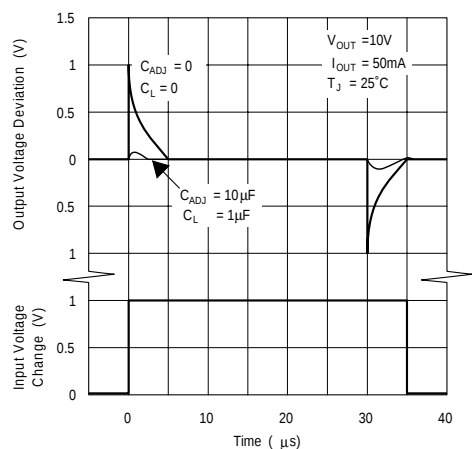
Current Limit



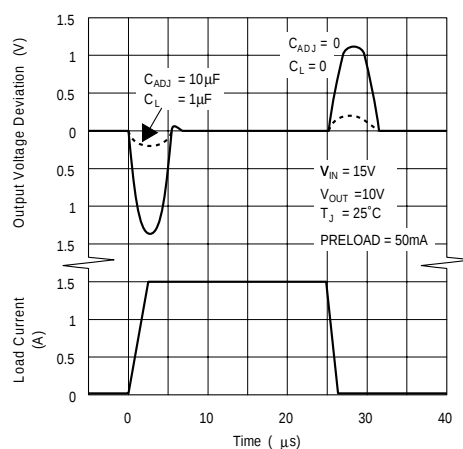
Current Limit



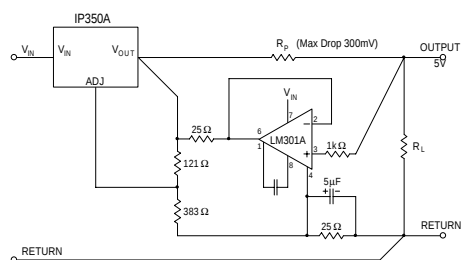
Line Transient Response



Load Transient Response

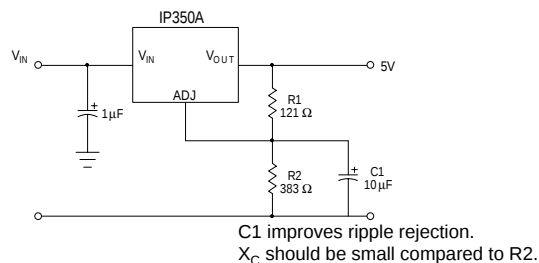
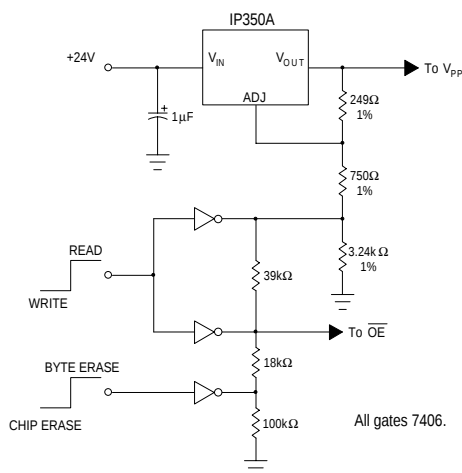


Remote Sensing

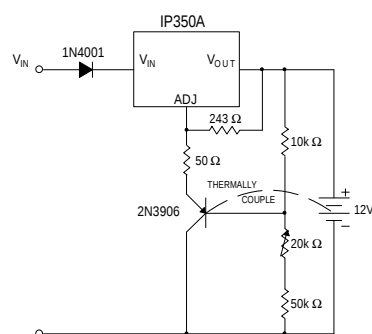


The diagram shows a 5V regulator circuit. An input voltage V_{IN} is connected to the input of an IP350A regulator. A $1\mu F$ capacitor is connected between the input and ground. The regulator's output is connected to a 121Ω resistor, which is then connected to a 383Ω resistor, resulting in a $5V$ output V_{OUT} . A TTL input is connected to the base of a 2N3904 transistor through a $1k\Omega$ resistor. The transistor's emitter is grounded, and its collector is connected to the output of the regulator. A $1k\Omega$ resistor is connected between the base and emitter of the transistor.

Improving Ripple Rejection



Temperature Compensated Lead–Acid Battery Charger



	OE	V _{PP}
READ	0V	5V
WRITE		
BYTE	5V	21V
CHIP ERASE	12V	21V